

**CLAIMS:**

1. An automatic mirror position adjustment system for a vehicle, comprising:
  - (a) at least one mirror movably mountable to said vehicle;
  - 5 (b) a turning sensor mountable to said vehicle and adapted for generating input signals responsive to rotations of said vehicle about at least two orthogonal axes;
  - (c) a control unit operatively connected to said turning sensor and adapted for generating output signals responsive to said input signals;
  - 10 (d) a driving mechanism operatively connected to said control unit and coupled to the or each said at least one mirror for rotating the or each mirror about said at least two orthogonal axes in response to said output signals.
- 15 2. A system according to claim 1, wherein said turning sensor is adapted for generating input signals responsive to yawing and pitching rotations of said vehicle.
3. A system according to claim 1, wherein said turning sensor is adapted for generating input signals responsive to yawing and rolling rotations of said  
20 vehicle.
4. A system according to claim 1, wherein said turning sensor is adapted for generating input signals responsive to rolling and pitching rotations of said vehicle.
5. A system according to claim 1, wherein said turning sensor is adapted for  
25 generating input signals responsive to yawing, pitching and rolling rotations of said vehicle.
6. A system according to claim 1, wherein said turning sensor is gyroscope-based.

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7. A system according to claim 6, wherein said gyroscope is any one of a mechanical gyroscope, laser gyroscope and optical gyroscope.
8. A system according to claim 1, wherein said turning sensor comprises a accelerometer arrangement capable of measuring accelerations of said vehicle in  
5 said at least two axes coupled to an angular rate sensor arrangement capable of measuring rotation rate of said vehicle in said at least two axes.
9. A system according to claim 8, wherein said accelerometer arrangement is capable of measuring accelerations of said vehicle in three orthogonal axes including said at least two axes.
- 10 10. A system according to claim 9, wherein said angular rate sensor is capable of measuring angular rate of said vehicle in three orthogonal axes including said at least two axes.
11. A system according to claim 10, further comprising processing means for integrating angular rate about each axis provided by said angular rate sensor to  
15 provide raw angles about each axis, and for inferring tilt angle about each axis from acceleration measurements provided by said accelerometer arrangement, and for forcing the raw angles to match the tilt angles for each axis over a predetermined time period.
12. A system according to claim 11, wherein said processing means is  
20 comprised in said control unit.
13. A system according to claim 11, wherein said processing means comprises a digital signal processor.
14. A system according to claim 1, wherein said driving mechanism is adapted for rotating the or each mirror about in three orthogonal axes including  
25 said at least two axes.
15. A system according to claim 14, wherein said driving mechanism comprises a motor arrangement for rotating the corresponding said mirror about said three orthogonal axes.
16. A system according to claim 1, wherein said control unit comprises a  
30 microprocessor unit.

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17. A system according to claim 1, wherein said control unit is adapted to provide said output signals according to predetermined criteria.
18. A system according to claim 17, wherein said control unit provides said output signals to said driving mechanism such that said driving mechanism  
5 provides a rotation to said corresponding mirror in each said axis in directions opposed to the rotation of the said vehicle about each said axis, respectively.
19. A system according to claim 18, wherein said control unit is adapted for providing output signals to said driving mechanism for returning said at least one mirror to a default position that provides optimal fields of view to a driver of the  
10 vehicle when the vehicle is traveling along a straight and level path.
20. A system according to claim 18, wherein said control unit is adapted for providing output signals to said driving mechanism for yawing said at least one mirror to a position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a curved path.
- 15 21. A system according to claim 20, wherein said control unit is adapted for maintaining a yaw angle between said at least one mirror and said vehicle substantially constant when said vehicle is traveling along a curved path of substantially constant curvature.
22. A system according to claim 18, wherein said control unit is adapted for  
20 providing output signals to said driving mechanism for pitching said at least one mirror to a position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along an inclined path.
23. A system according to claim 22, wherein said control unit is adapted for maintaining a pitch angle between said at least one mirror and said vehicle  
25 substantially constant when said vehicle is traveling along an inclined path of substantially constant gradient.
24. A system according to claim 23, wherein said constant pitch angle relative to said vehicle is substantially similar to a pitch angle of said at least one mirror at a default position thereof that provides optimal fields of view to a driver  
30 of the vehicle when the vehicle is traveling along a straight and level path.

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25. A system according to claim 18, wherein said control unit is adapted for providing output signals to said driving mechanism for rolling said at least one mirror to a position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a banked path.
- 5 26. A system according to claim 25, wherein said control unit is adapted for maintaining a roll angle between said at least one mirror and said vehicle substantially constant when said vehicle is traveling along a banked path of substantially constant gradient.
27. A system according to claim 26, wherein said constant roll angle relative  
10 to said vehicle is substantially similar to a roll angle of said at least one mirror at a default position thereof that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path.
28. A system according to claim 1, further comprising an interface unit operatively connected to said control unit.
- 15 29. A system according to claim 28, wherein said interface unit is adapted for instructing said control unit to provide output signals to said driving mechanism for returning said at least one mirror to a default position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path.
- 20 30. A system according to claim 29, wherein said interface unit is adapted for setting and storing said default positions for a plurality of users.
31. A system according to claim 28, wherein said interface unit is adapted for enabling a user to selectively activate or deactivate said system.
32. A system according to claim 31, wherein said interface unit is adapted  
25 for instructing said control unit to provide output signals to said driving mechanism for returning said at least one mirror to a default position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path, when said system is deactivated.
33. A system according to claim 1, wherein said control unit is adapted for  
30 selectively providing output signals responsive to a predetermined input, wherein

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said driving mechanism to pan the or each mirror through a predetermined angular path about said at least one said axis in response to said output signals.

34. A system according to claim 33, wherein said angular path provides a yawing rotation to said at least one mirror.

5 35. A system according to claim 33, wherein angular path provides a visual scan of an effectively expanded field of view for a driver of said vehicle via a corresponding said mirror.

36. A system according to claim 34, wherein said angular path includes a rotation of a corresponding said mirror inboard towards said vehicle and  
10 outboard away from said vehicle.

37. A system according to claim 33, wherein said predetermined input is provided via an interface unit operatively connected to said control unit.

38. A system according to claim 37, wherein said predetermined input is provided by an indicator circuit operatively connected to said control unit.

15 39. A system according to claim 1, wherein said system is accommodated in a suitable housing.

40. A system according to claim 1, wherein said at least one mirror comprises first rear view mirror internally mounted in said vehicle, a second rear view mirror externally mounted to a right side of said vehicle, and a third rear  
20 view mirror externally mounted to a left side of said vehicle.

41. A automatic mirror panning system for a vehicle, comprising:

- (a) at least one mirror movably mountable to said vehicle;
- (b) a control unit adapted for generating output signals responsive to a predetermined input signal;
- 25 (c) a driving mechanism operatively connected to said control unit and coupled to the or each said at least one mirror for panning the or each mirror through a predetermined angular path about said at least one axis in response to said output signals.

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42. A system according to claim 41, wherein said angular path provides a yawing rotation to said at least one mirror.
43. A system according to claim 41, wherein angular path provides a visual scan of an effectively expanded field of view for a driver of said vehicle via a  
5 corresponding said mirror.
44. A system according to claim 43, wherein said angular path includes a rotation of a corresponding said mirror inboard towards said vehicle and outboard away from said vehicle.
45. A system according to claim 41, wherein said driving mechanism  
10 comprises a motor arrangement for rotating the corresponding said mirror about at least said one axis.
46. A system according to claim 41, wherein said control unit comprises a microprocessor unit.
47. A system according to claim 41, wherein said predetermined input is  
15 provided via an interface unit operatively connected to said control unit.
48. A system according to claim 41, wherein said predetermined input is provided by an indicator circuit operatively connected to said control unit.
49. A system according to claim 41, wherein said system is accommodated in a suitable housing.
- 20 50. A system according to claim 47, wherein said interface unit is adapted for enabling a user to selectively activate or deactivate said system.
51. A system according to claim 50, wherein said interface unit is adapted for instructing said control unit to provide output signals to said driving mechanism for returning said at least one mirror to a default position that  
25 provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path, when said system is deactivated.
52. A system according to claim 1, wherein said at least one mirror comprises any one of a rear view mirror internally mounted in said vehicle, a rear view mirror externally mounted to a right side of said vehicle, and a rear view  
30 mirror externally mounted to a left side of said vehicle.

53. An automatic mirror position adjustment method for a vehicle, comprising:
- 5 (a) providing at least one mirror movably mountable to said vehicle;
- (b) sensing rotation of said vehicle about at least two orthogonal axes and generating input signals responsive to said rotation;
- (c) generating output signals responsive to said input signals;
- 10 (d) rotating the or each mirror about said at least two orthogonal axes in response to said output signals.
54. A method according to claim 53, wherein said input signals are generated in responsive to yawing and pitching rotations of said vehicle.
55. A method according to claim 53, wherein said input signals are  
15 generated in responsive to yawing and rolling rotations of said vehicle.
56. A method according to claim 53, wherein said input signals are generated responsive to rolling and pitching rotations of said vehicle.
57. A method according to claim 53, wherein said input signals are generated responsive to yawing, pitching and rolling rotations of said vehicle.
- 20 58. A method according to claim 53, wherein said rotation is sensed via a suitable gyroscope.
59. A method according to claim 58, wherein said gyroscope is any one of a mechanical gyroscope, laser gyroscope and optical gyroscope.
60. A method according to claim 53, wherein said rotation is sensed via an  
25 accelerometer arrangement capable of measuring accelerations of said vehicle in said at least two axes coupled to an angular rate sensor arrangement capable of measuring rotation rate of said vehicle in said at least two axes.
61. A method according to claim 60, wherein said accelerometer arrangement measures accelerations of said vehicle in three orthogonal axes  
30 including said at least two axes.

62. A method according to claim 61, wherein said angular rate sensor measures angular rate of said vehicle about three orthogonal axes including said at least two axes.
63. A method according to claim 62, further comprising the step of  
5 integrating angular rate about each axis provided by said angular rate sensor to provide raw angles about each axis, and inferring tilt angle about each axis from acceleration measurements provided by said accelerometer arrangement, and forcing the raw angles to match the tilt angles for each axis over a predetermined time period.
- 10 64. A method according to claim 57, comprising the step of rotating the or each mirror about three orthogonal axes including said at least two axes.
65. A method according to claim 53, wherein said output signals are provided according to predetermined criteria.
66. A method according to claim 65, wherein said mirror is rotated about  
15 each said axis in a direction opposed to the rotation of the said vehicle about each corresponding said axis, respectively, responsive to said output signals.
67. A method according to claim 65, wherein said output signals for returning said at least one mirror to a default position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight  
20 and level path.
68. A method according to claim 65, wherein said at least one mirror is yawed to a position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a curved path in response to said output signals.
- 25 69. A method according to claim 68, wherein a yaw angle between said at least one mirror and said vehicle is maintained substantially constant when said vehicle is traveling along a curved path of substantially constant curvature.
70. A method according to claim 65, wherein said at least one mirror is pitched to a position that provides optimal fields of view to a driver of the vehicle



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when the vehicle is traveling along an inclined path in response to said output signals.

71. A method according to claim 70, wherein a pitch angle between said at least one mirror and said vehicle is maintained substantially constant when said  
5 vehicle is traveling along an inclined path of substantially constant gradient.

72. A method according to claim 71, wherein said constant pitch angle relative to said vehicle is substantially similar to a pitch angle of said at least one mirror at a default position thereof that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path.

10 73. A method according to claim 65, wherein said at least one mirror is rolled to a position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a banked path in response to said output signals.

74. A method according to claim 73, wherein a roll angle between said at  
15 least one mirror and said vehicle is maintained substantially constant when said vehicle is traveling along a banked path of substantially constant gradient.

75. A method according to claim 74, wherein said constant roll angle relative to said vehicle is substantially similar to a roll angle of said at least one mirror at a default position thereof that provides optimal fields of view to a driver of the  
20 vehicle when the vehicle is traveling along a straight and level path.

76. A method according to claim 53, further comprising the step of providing output signals for returning said at least one mirror to a default position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path.

25 77. A method according to claim 76, comprising the step of setting and storing said default positions for a plurality of users.

78. A method according to claim 53, further comprising selectively providing output signals responsive to a predetermined input, wherein the or each mirror is panned through a predetermined angular path about said at least one  
30 said axis in response to said output signals.

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79. A method according to claim 78, wherein said angular path provides a yawing rotation to said at least one mirror.

80. A method according to claim 78, wherein angular path provides a visual scan of an effectively expanded field of view for a driver of said vehicle via a  
5 corresponding said mirror.

81. A method according to claim 80, wherein said angular path includes a rotation of a corresponding said mirror inboard towards said vehicle and outboard away from said vehicle.

82. A method according to claim 78, wherein said predetermined input is  
10 provided via an interface unit operatively connected to a control unit for generating said output signals.

83. A method according to claim 78, wherein said predetermined input is provided by an indicator circuit operatively connected to a control unit for generating said output signals.

15 84. A method according to claim 53, wherein said at least one mirror comprises first rear view mirror internally mounted in said vehicle, a second rear view mirror externally mounted to a right side of said vehicle, and a third rear view mirror externally mounted to a left side of said vehicle.

85. A automatic mirror panning method for a vehicle, comprising:

- 20 (a) at least one mirror movably mountable to said vehicle;  
(b) generating output signals responsive to a predetermined input signal;  
(c) panning the or each mirror through a predetermined angular path about said at least one axis in response to said output signals.

25 86. A method according to claim 85, wherein said angular path provides a yawing rotation to said at least one mirror.

87. A method according to claim 85, wherein angular path provides a visual scan of an effectively expanded field of view for a driver of said vehicle via a corresponding said mirror.

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88. A method according to claim 87, wherein said angular path includes a rotation of a corresponding said mirror inboard towards said vehicle and outboard away from said vehicle.

89. A method according to claim 85, wherein said predetermined input is  
5 provided via an interface unit operatively connected to a control unit for generating said output signals.

90. A method according to claim 85, wherein said predetermined input is provided by an indicator circuit operatively connected to a control unit for generating said output signals.

10 91. A method according to claim 85, further comprising the step of providing output signals to said driving mechanism for returning said at least one mirror to a default position that provides optimal fields of view to a driver of the vehicle when the vehicle is traveling along a straight and level path, when said panning is terminated.

15 92. A method according to claim 85, wherein said at least one mirror comprises any one of a rear view mirror internally mounted in said vehicle, a rear view mirror externally mounted to a right side of said vehicle, and a rear view mirror externally mounted to a left side of said vehicle.